

Space Exploration



A Presentation for Mulberry Merit Badge Day

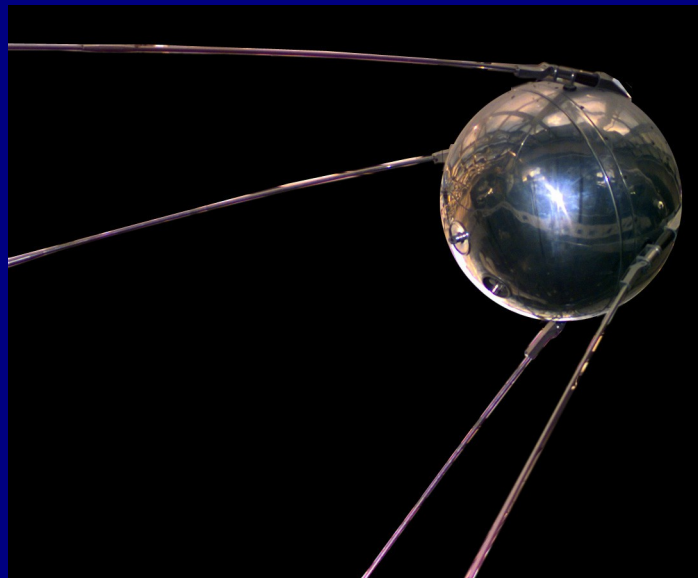
Mitzi Adams
NASA/MSFC
December 10, 2016

A Brief History of Rockets

- c. 300 B.C.E. Archytas the Greek flew model pigeon propelled by water vapor
- c. 100 C.E. Chinese filled hollow pieces of bamboo with gunpowder
- c. 1232 Chinese used rockets as weapons
- c. 1690 Sir Isaac Newton composed the three laws of physics that quantify how and why rockets work.
 1. An object in motion will stay in motion unless acted on by an unbalanced force. An object at rest will stay at rest unless acted on by an unbalanced force. Law of Inertia
 2. Acceleration is produced when a force acts on a mass. $a=F/m$
 3. For every action there is an equal and opposite reaction.
- 1898 Konstantin Tsiolkovsky proposed idea of exploring space using rockets
1903 published *Exploration of the Universe with Rocket Propelled Vehicles*
Wernher von Braun read Tsiolkovsky
- 1926 Robert Goddard successfully launched a **liquid-fueled** rocket
- 1940s Wernher von Braun used the V-2 rocket in warfare against England

History -- continued

October 4, 1957 -- Sputnik I launched, 83.6 kg (I am about 50 kg)



Scientific Purpose: Measure atmospheric density and propagation of radio waves in ionosphere

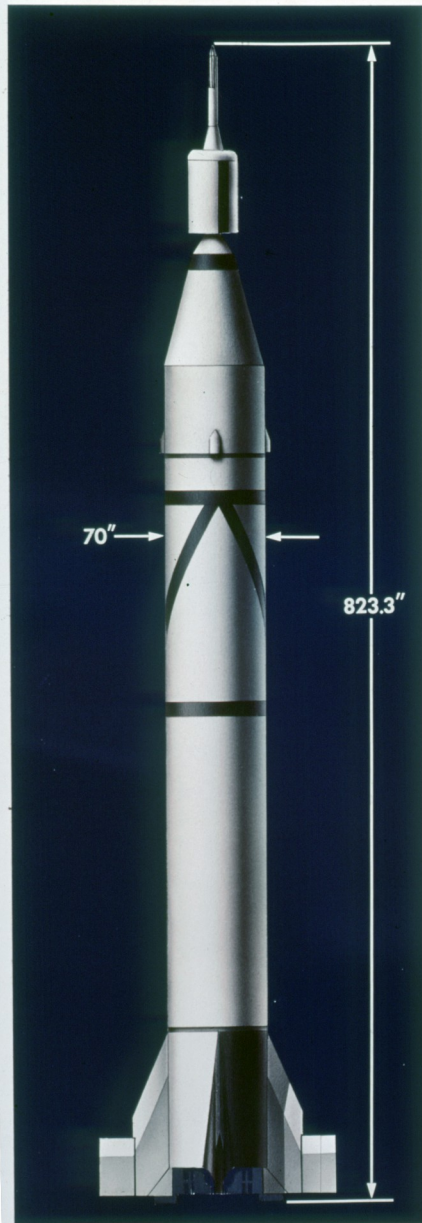
Listen! Sputnik .wav file

The U.S. Retaliates!

Explorer I

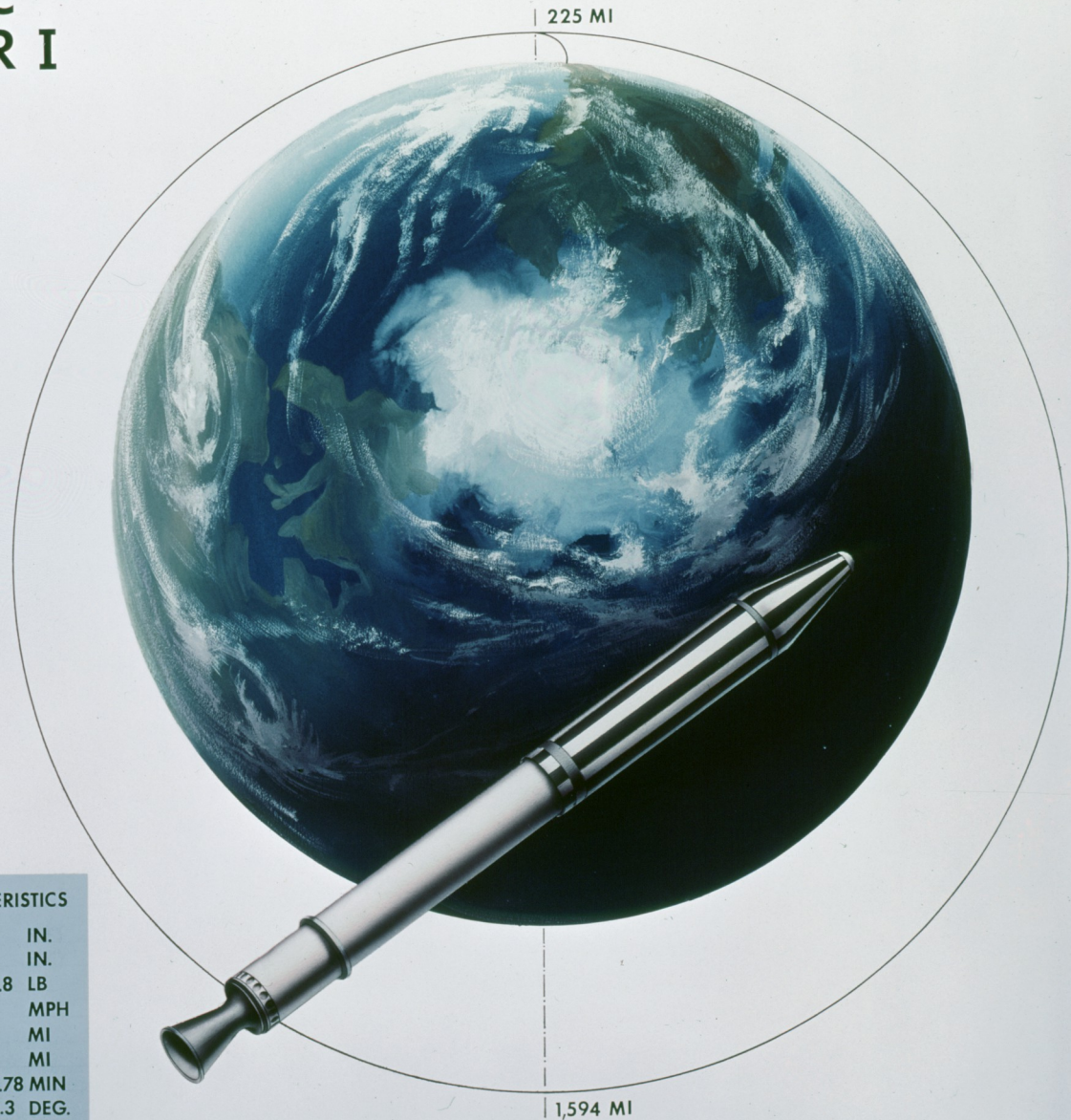
January 22, 1958

JUPITER-C EXPLORER I



EXPLORER MAIN CHARACTERISTICS

LENGTH	80	IN.
DIAMETER	6	IN.
WEIGHT	30.8	LB
VELOCITY (APPROX.)	18,000	MPH
APOGEE ALTITUDE	1,594	MI
PERIGEE ALTITUDE	225	MI
PERIOD	114.78	MIN
MAXIMUM LATITUDE	33.3	DEG.



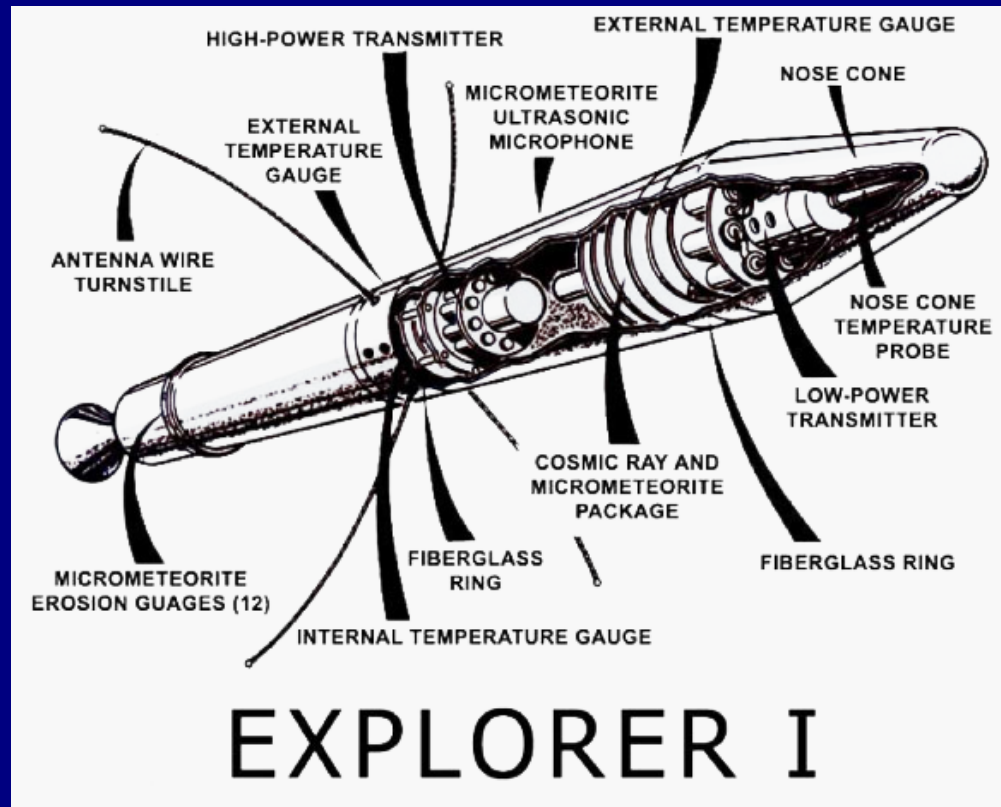
Explorer 1 (continued)



William Pickering

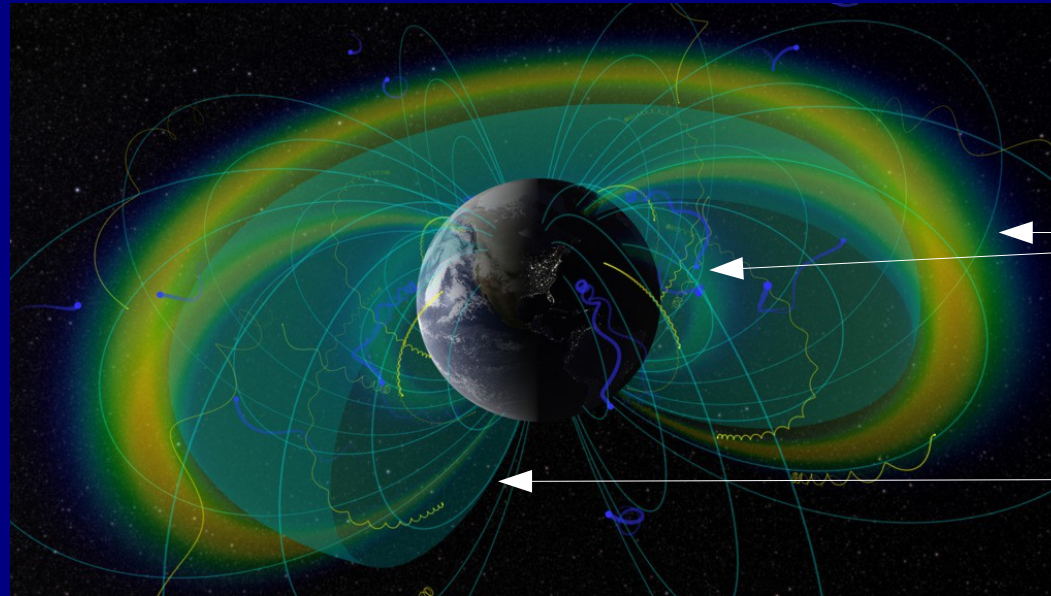
James van Allen

Wernher von Braun



Explorer I Discovery

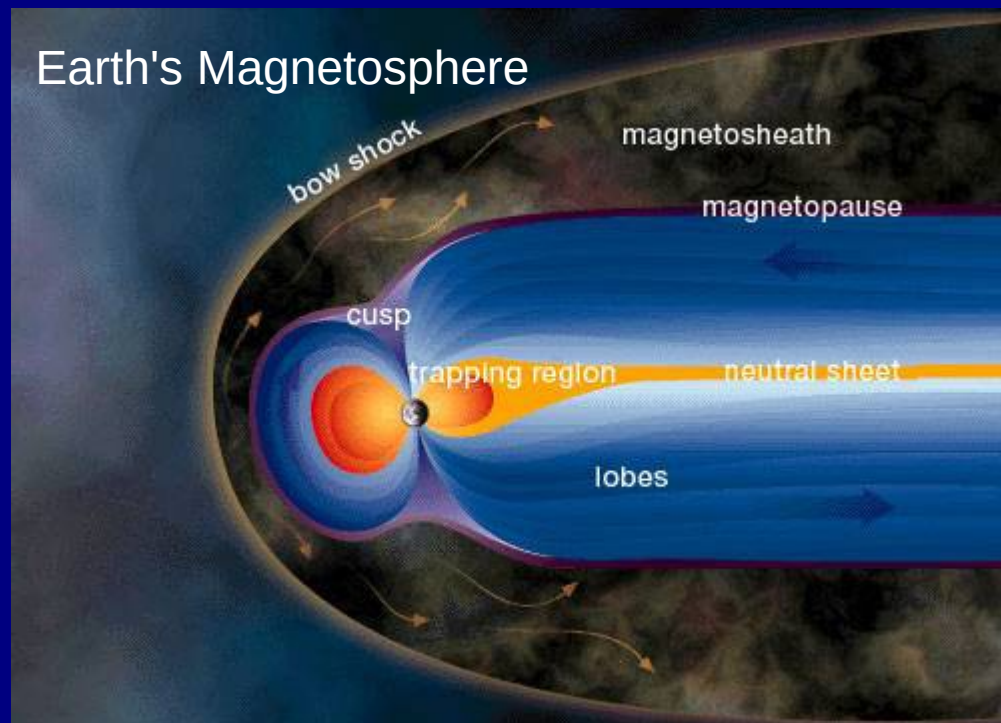
Belts sliced open to
show plasmapause
surface and particle
trajectories trapped
by magnetic field



Radiation belts,
multi color

Plasmapause,
blue green

Earth's Magnetosphere



Show Animation!